Klamath Basin Monitoring Program: Concepts for Consideration

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Water Quality Monitoring and Ecosystem Characterization

- Water Quality Monitoring Programs are the primary methods of characterizing Aquatic Ecosystems
- Information is used
  - As a basis for scientific analysis
  - To monitor short- and long-term trends and
  - To provide information for management decisions
  - To assess management actions and provide basis for adaptive management

Water Quality Monitoring: Value

- Critical water quality data is generally expensive to collect, process, and maintain (even before it is used in analyses)
- However, we cannot truly manage our aquatic resources in today's water resources climate without this data (e.g., regulatory criteria, restoration).

Water Quality Data Categories

- Consider five general categories of water quality data based on sampling methods
  - Water temperature: remote logging thermistor
  - Physical characteristics: water quality probe
  - Physical and chemical: grab samples
  - Biological: grab/discrete samples
  - Other: grab/discrete samples (pesticides/herbicides, trace elements)
- These data provide unparalleled description of the aquatic system.

[This does not include the supporting data necessary in many analysis, e.g., geomorphology, hydrology, meteorology, biology, land use, geohydrology…]

Monitoring/Data Attributes

- Attributes:

	Easy/low		Hard/high
– Relatively ease	1	to	5
– Instrument Expense	1	to	5
– Device/method failure	1	to	5
– Frequency:	Sub-daily (1)	daily (3)	>daily (5)
– Data management costs (QA)	1	to	5
– Field costs	1	to	5

Physical: Temperature Loggers

- Methodology: remote logging thermistor for water temperature
- Attributes:
  - Relatively ease 1
  - Instrument/method Expense 1
  - Device/method failure 1
  - Frequency Sub-daily (1)
  - Data management costs (QA) 1
  - Field costs 1

  Σ = 6
- Notes: water temperature is one of the most valuable data sets

Physical: Water Quality Probes

- Methodology: single or multi-parameter water quality probes (logging capability) for temperature, dissolved oxygen, conductance, pH, turbidity, redox
- Attributes:
  - Relatively ease 2
  - Instrument/method expense 3
  - Device/method failure 2
  - Frequency Sub-daily(1)
  - Data management costs (QA) 2
  - Field costs 3

  Σ = 13
- Notes: sub-daily physical data are high value data sets

Physical and Chemical: Analytical Methods

- Methodology: field collection via grabs/discrete samples and laboratory analysis (nutrients, BOD, major ions, etc.)
- Attributes:
  - Relatively ease 4
  - Instrument/method expense 4
  - Device/method failure 3
  - Frequency daily, >daily (4)
  - Data management costs (QA) 4
  - Field costs 4

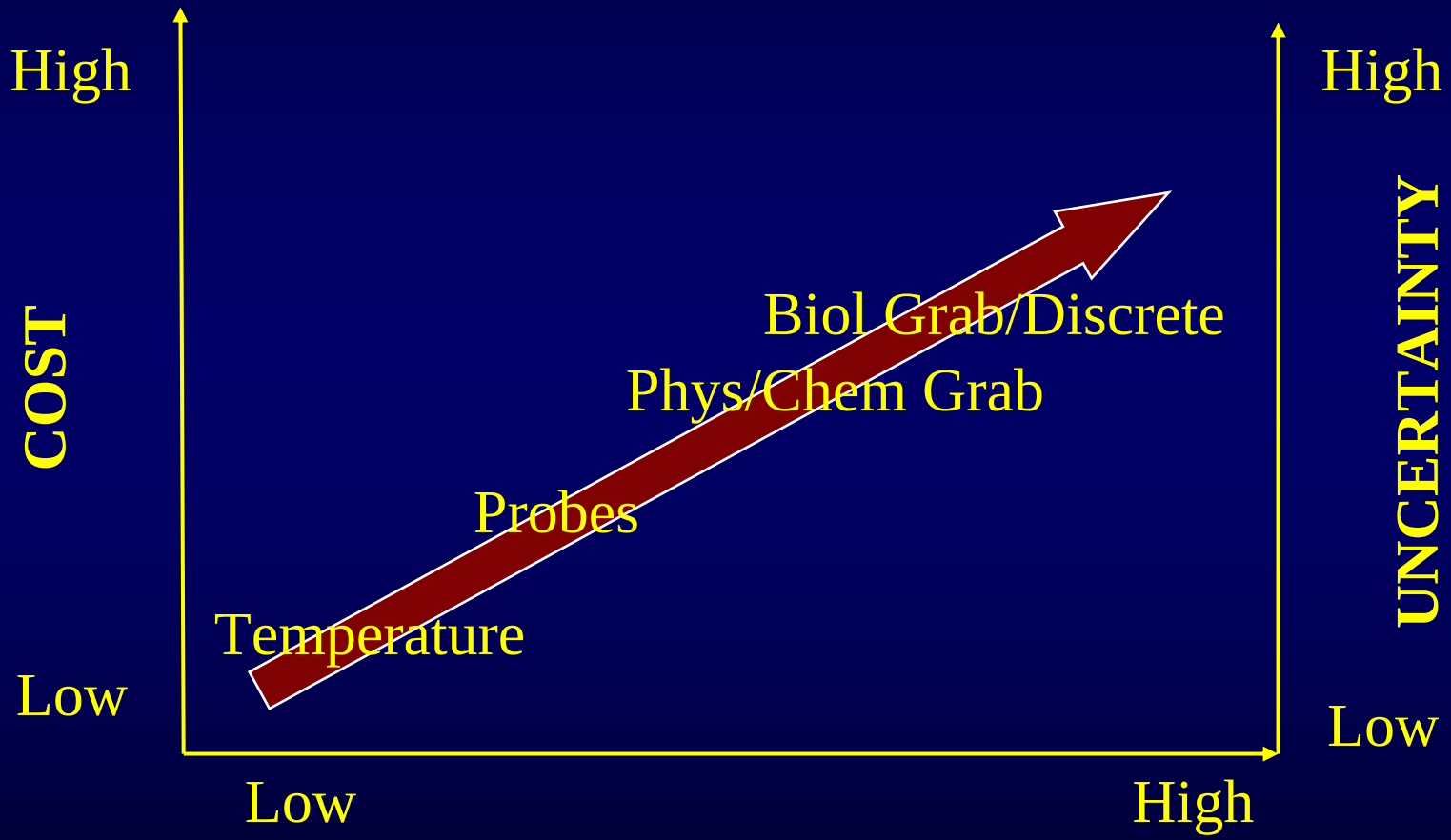
Σ = 23

Biological: Analytical Methods

- Methodology: field collection via grabs/discrete samples and laboratory analysis (algae, macroinvertebrates, etc.)
- Attributes:
  - Relatively ease 4
  - Instrument/method expense 4
  - Device/method failure 3
  - Frequency daily, >daily (4)
  - Data management costs (QA) 4
  - Field costs 4

Σ = 23

Cost vs. Implementation Effort



Framework Concepts*

- Scope
- Data…some definitions
- Sampling Programs
- Sampling Considerations
- Overall basin objective
- Sub-objectives
- Quality Assurance
- Resources

*Just ideas!

Scope

- Klamath Basin
  - Williamson and Sprague River
  - Upper Klamath Lake
  - Klamath River below Upper Klamath Lake
- Cannot ignore upstream reaches, role of tributaries

Data…Examples

1. Baseline data
   - General system characteristics (intra and inter-annual)
   - Long-term response (trends, response to management)
   - Frequency: monthly to quarterly
2. Seasonal data
   - Asking more detailed questions, built upon baseline data
   - Frequency: daily to monthly
3. Specific studies
   - Asking specific questions based on 2, and 3.
   - Frequency: sub-daily to daily/weekly
   - May relate multiple data types to answer questions
4. Other

Sampling Programs

- Baseline/Seasonal
  - Thermistor network (mainstem, Scott, Salmon)
  - Data sonde network (mainstem)
  - Grab sample (mainstem)
  - SWAMP

Sampling Programs

- Detailed:
  - Pulse flow
  - Iron Gate turnover
  - Phytoplankton and microcystin studies
  - Ceratomixis shasta
  - Periphyton
  - Ammonia
  - Trinity River – Lewiston Dam Releases
  - Estuary

Sampling Considerations

- Spatial
  - Where should monitoring occur?
  - Is there a need for multiple sampling at a particular site (e.g., multiple depths in reservoirs)?
- Temporal
  - When should monitoring occur?
  - At what frequency should monitoring occur?
    - Discrete data?
    - Time Series data?

Basin-wide Objective

- Goal: identify an objective that all water quality monitoring programs fall under
- Retain flexibility to incorporate "special" studies, adapt to new information
- Specific example of basin-wide objective:

  "*Collect water quality data to form required baseline data and detailed studies to support aquatic resources management.*"

Sub-Objectives

- Require a specific objective for all programs
- Tie smaller, more specific studies to basin-wide objective
- Do not try to do too much: avoid "add-ons" and "dilution" of studies

Quality Assurance

- Quality Assurance Project Plan
- Standard Operating Procedure

- Do we need uniform QA/SOP? Do we need "minimum" QA/SOP? Do we need QA/SOP?

"Resources"

- Money
- Time
- Energy
  - That's it…

Possible Framework Concepts/Issues

- Complete a basin-wide status evaluation: what is being done where, by whom, when, and WHY?
- Prioritize data needs based on
  - Baseline
  - Seasonal (do we have/need baseline to support this?)
  - Detailed (do we have/need baseline/seasonal to support this?)
- Should (a) cost, (b) implementability, (c) uncertainty be considered in prioritizing monitoring?
- Should individual reaches be identified (but with a formal interface)?

Possible Steps

1. Systematic Inventory
2. Develop basin-wide objective
3. Assess baseline monitoring needs/gaps
4. Develop sub-basin objectives
5. Assess “detailed” studies
6. Identify available resources
7. Prioritize baseline and “detailed” studies

Temperature Example

- Objective: characterize year-round, sub-daily variation in river (including tributaries) and reservoirs
- Locations: generic
  - Above and/or below reservoirs and major tributaries
  - Reservoir profiles (spatial and temporal frequency?)
  - Do we have this covered? Who is in charge
- Period: Year-round
- Frequency: 1-hour maximum